TITLE OF INVENTION

Flexible Back Mechanism For Stackable Chairs

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] Not Applicable.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0002] Not Applicable.

BACKGROUND OF INVENTION

1. Field of Invention

[0003] This invention relates generally to the field of movable and stackable seating. More particularly, this invention relates to chairs having a self-adjustable back support while retaining a stackable function.

2. Description of Related Art

[0004] Prior chairs having a flexible backrest frame have provided frame members with spring members connected internal of seat tube members for control of movement of the backrest frame of the chair. A typical flexible backrest is illustrated in U.S. Patent 5,039,163, issued to Tolleson, which discloses a chair including depending leg members and a

hollow support frame having members with open ends terminating beneath the seat assembly of the chair. The chair includes a pair of hollow backrest frame members having open frame ends extending beneath the seat assembly for alignment with respective open ends of the support frame members. Each open end of the respective frame members includes at least one flexible spring member inserted therein. Prior configurations of spring members allow insertion of opposed spring member ends into opposed and aligned open frame ends, with each spring member being aligned with the frame ends and extended to fill any gap between the respective back frame members and support frame members. Therefore, replacement of the spring member required full disassembly of the chair frame and removal of each inserted spring member end. In order to prevent each spring element from excessive flexing during reclining movements of the chair backrest, the spring member ends have been typically enclosed by pairs of U-shaped brackets of metal that limit the range of angular movement of each enclosed spring member, thereby limiting the reclining movements of the chair backrest. Additional pairs of spring members and U-shaped brackets have been required to be added for rigorous use. The additional pairs of spring members are typically position parallel to each first set of spring members with associated enclosure by U-shaped brackets of greater width or depth,

thereby requiring an increased width or depth of the support frame members to accommodate the additional spring members and brackets.

[0005] Another example of a chair having a flexible backrest frame is illustrated in U.S. Patent 6,471,293, issued to Ware et al., which discloses a chair frame including respective pairs of seat support leg members having a front spring reinforcement bar interconnected therebetween, and including a back support frame having lower ends with a rear spring reinforcement bar interconnected therebetween. Movements of the back support frame relative to the seat support leg members are regulated by a pair of spring members connected to span between front and rear spring reinforcement bars. Limits to movements of the spring members and back support member are provided by a seat cushion having a two-piece, split platform member with a front portion and rear portion moved relative to each other in response to flexing of spring members. A plurality of bolt brackets affix the spring members opposed ends to each front and rear spring reinforcement bar and to front and rear split platform members of the seat cushion. Repetitive rearward and forward movement of the back support frame flexes each spring member and moves the seat split platform members relative to each other, thereby repetitively flexing the seat cushion.

[0006] There is a need for a stackable flexible chair back that provides a spring member assembly attached between a back frame and a seat assembly having a seat cushion thereon, and configured to limit the back frame rearward movement and forward movement while minimizing contact between the spring member assembly and the seat cushion thereby reducing fatigue of the fabric covering the seat cushion. There is a need for a stackable chair having a flexible back frame connected to a seat assembly by a spring mechanism having a minimal number of parts that are readily replaceable to extend the useful life of the stackable chair.

BRIEF SUMMARY OF INVENTION

[0007] According to one embodiment of the present invention, a flexible back mechanism for a stackable chair is provided. The flexible back mechanism includes a seat spring system designed to allow reclining movement of a back frame while denying excessive forward movement of a back support relative to a seat assembly. The seat assembly includes right and left seat sides having spaced apart rear portions. Right and left pairs of front and rear leg members are attached outboard of respective right and left seat sides, with each pair of leg members extended in spaced apart orientation to allow stacking with like-configured chair frames.

[0008] The back support includes frame lower ends curved forwardly and positioned in registry with and spaced apart by a gap separation from the rear portions of the seat assembly. A back support rear member is attached inwardly of the frame lower ends. Right and left spring members are positioned inwardly adjacent of each frame lower end, with the rear end of each spring member connected to the back support rear member. Each spring member is extended a sufficient length to position a front end forward of each gap separation for connection inwardly adjacent of respective right and left seat sides. Each spring member front end is affixed to respective right and left front support members extended laterally inwardly from and joined to respective rear portions of the seat assembly.

[0009] A right and left pair of fixation plates are attached in abutting and aligned relationship in a covering engagement on each front and rear ends of respective spring members in order to securely affix each spring member end during repetitive reclining movements. The pairs of fixation plates in abutting relationship will negate excessive forward pivoting of the back support relative to the seat assembly. During reclining movement of the back support, the rear support member and attached spring member rear ends are pivotably flexed downwardly to a flexed position. Each spring

member is capable of repetitive flexing and includes an inherent bias to rebound to a non-flexed position, thereby returning the back support to a substantially upright position when not reclined by a seat occupant.

BRIEF DESCRIPTION OF SEVERAL VIEWS OF THE DRAWINGS

[0010] The above mentioned features of the invention will become more clearly understood from the following detailed description of the invention contained herein, read together with the drawings in which:

Figure 1 is a bottom perspective view of one embodiment of a chair illustrating the underside elements of a flexible back chair having a seat spring system in accordance with the present invention;

Figure 2 is a bottom perspective view of Figure 1, illustrating one unit of the seat spring system of the chair of Figure 1;

Figure 3 is a top view of the chair having a seat spring system inwardly projecting from each seat frame member and extending laterally inwardly of a lower portion of a back support frame;

Figure 4 is an exploded perspective view of one embodiment of the seat spring system positioned to join between a left seat member and a left frame end of the back support frame;

Figure 5 is a cross-sectional interior side view of the embodiment of Figure 1, illustrating a non-flexed position for the seat spring system;

Figure 6 is a cross-sectional interior side view of the embodiment of Figure 1, illustrating a flexed position for the seat spring system;

Figure 7A is a top view of an alternative embodiment for a front flanged support member projecting inwardly from a seat frame member; and

Figure 7B is an exploded perspective view of the alternative embodiment of Figure 7A, illustrating a left front flanged support member having a flanged side attached to a left seat member of the seat assembly.

DETAILED DESCRIPTION OF THE INVENTION

[0011] A flexible back mechanism for stackable chairs is disclosed incorporating various features of the present invention for a stackable chair **10** as illustrated in Figures 1 - 7B. The stackable chair **10** of the present invention is designed to provide a seat assembly **12** having a partially reclining back support frame **50** attached to rear portions of the seat assembly **12** by a seat spring system **60**. As illustrated in Figure 3, the seat spring system **60** includes right and left seat spring units **62**, **62'** disposed laterally and inwardly of respective right and left sides of the seat assembly **12**, and laterally inwardly of respective right and left sides of lower portions of a back support frame **50** positioned proximal to rear portions of the seat assembly **12**. The seat spring system **60** includes unique features discussed hereinbelow for allowing the back support frame **50** to be reclined

backwards within a limited range of motion while limiting excessive forward rebound motion of the back support frame **50** relative to seat assembly **12**.

[0012] For support of a removable seat cushion **90**, the seat assembly **12** includes a front seat member **14** joined at opposed ends to a right seat member **16** and a left seat member **18**. The right and left seat members **16**, **18** extend rearward to right and left rear portions **16"**, **18"** (see Fig. 3), and are disposed in a substantially horizontal plane extending from the front seat member **14**. The right and left rear portions **16"**, **18"** are spaced apart in a generally parallel orientation and do not have a rear seat member extended to connect therebetween. The front, right and left seat members **14**, **16**, **18** can be any cross-sectional shape utilized for chair frames, including but not limited to cylindrical, oval or square in cross-section. The seat assembly **12** is connected to the back support frame **50** by laterally inwardly positioned right and left spring members **64** of the seat spring system **60** discussed further hereinbelow. The unique configuration of the seat spring system **60** negates a need for a front spring reinforcement cross-support extended between seat members **16**, **18**, therefore a void space **20** exists between right and left spring units **62**, **62'**.

[0013] The seat assembly **12** is supported at a typical seating height above a supporting surface by a pair of right and left leg member units **22**, **30** utilizing right front **24** and rear **26** legs, and left front **32** and rear **34** legs extending downwardly at respective forward and rearward angles. Each leg member unit **22**, **30** includes an upper leg member support **22'**, **30'** that is disposed in a substantially horizontal orientation parallel with, and joined outboard to the respective outer surfaces of the right and left seat members **16**, **18**. The front legs **24**, **32** are offset laterally from the rear legs **26**, **34** by an outwardly displacement **42**, **44** of about one-eighth inch to about one-quarter inch (see Fig. 3), to improve the stability of the stackable chair **12**.

[0014] The outboard positioning of the right and left leg member units **22**, **30** facilitate generally vertical stacking of the chair **10** with like-configured chairs having similarly positioned leg member units disposed outboard of each seat assembly **12**. In order to improve stability of the leg member units **22**, **30**, the front right and left legs **24**, **32** can have an upper leg cross member **40** extended between the front legs **24**, **32**, and positioned below the front portions of respective right and left seat members **16**, **18**. The front legs **24**, **32** can be angled laterally and outwardly to provide a lower leg width separation **40"** greater than an upper leg width separation

40' to improve stability of the chair **10** (see Fig. 1). The rear legs **26**, **34** have an upper rear cross-member **38** extended between upper portions of the rear legs **26**, **34**, thereby increasing rigidity of the rear leg members and also providing a stop mechanism for control of backwards pivoting of the back support frame **50** (discussed further hereinbelow).

[0015] Additional structural rigidity for the leg member units **22**, **30** is provided by a right lateral brace **28**, and a left lateral brace **36**, with each brace being extended between respective front and rear legs (see Fig. 1). The right lateral brace **28** and left lateral brace **36** are each positioned a spaced apart distance **20'** below respective upper leg members **22'**, **30'** (see Fig. 1). Upon stacking of like-configured chairs **10**, the lower surface of each lateral brace **28**, **36** will contact against the upper surface of the upper leg members of a like-configured seat assembly **12** having similar leg member units **22**, **30** attached thereto. Therefore, the spaced apart distance **20'** of the lateral braces below respective upper leg members **22'**, **30'** of each chair will maintain the lower portions of the seat assembly **12** spaced apart from the upper surface of a seat cushion **90** of a like-configured chair during stacking of chairs **10**, thereby minimizing wear on each seat cushion **90** when stacked. Further, if the lateral braces **28**, **36**

are attached sufficiently spaced below respective upper leg members **22'**, **30'**, the spaced apart distance **20'** will allow the respective legs to be aligned but remain spaced apart from each other during stacking, thereby minimizing scraping and abrasion on the legs surfaces during storage and movement of stacked chairs.

[0016] A back support frame **50** is positioned to extend generally upright from the rear portions **16"**, **18"** of the right and left seat members **16**, **18**. The back support frame **50** includes an upper portion **52** joined at opposed ends to right and left frame sides **54**, **56** which are spaced apart by a sufficient width to accept a back support cushion **50'** detachably connectable thereon (see Fig. 3). Each frame side **54**, **56** extends downwardly and is bent forwardly to form respective frame lower ends **54'**, **56'** that extend forwardly to a generally horizontal orientation in aligned registry with and spaced apart from the seat member rear portions **16"**, **18"**. Respective right and left frame lower ends **54'**, **56'** are separated by gaps **46**, **48** of about one eighth inch to about one quarter inch, from the respective seat member rear portions **16"**, **18"** (see Figs. 1 - 3). A back frame support cross-member **58** is attached between the back frame lower ends **54'**, **56'** to increase rigidity of the back support frame **50** and to

support each spring member **64** attached thereto. The cross-member **58** includes right and left end flanges **58"**, **58'"** joined by bonding and/or connectors to interior faced surfaces of frame lower ends **54'**, **56'**.

[0017] As illustrated in Figures 1 - 3, the stackable chair **10** includes a seat spring system **60** for connecting the lower ends of the back support frame **50** to the rear portions of the seat assembly **12**. The seat spring system **60** includes right and left spring units **62**, **62'** sized and secured to extend between the back support frame **50** and the seat assembly **12** in a configuration allowing the back support frame **50** to be reclined backwards in a limited range of motion while limiting excessive forward motion of the back support frame **50** relative to seat assembly **12**. The spring units **62**, **62'** include like-configured pairs of fixation plates **68**, **70** positioned in securing engagement over opposed ends of right and left spring members **64**, as illustrated for the left side spring unit **62'** in Figure 4.

[0018] In order to provide a back support frame **50** that repetitively reclines and rebounds to a generally vertical position relative to the seat assembly **12**, the opposed ends of each spring member **64** of spring units **62**, **62'** are connected to respective support structures of a lower portion of

the back support **50** and rear portions of the seat assembly **12**. Each spring member **64** includes a substantially planar and elongated body member having an adequate length to extend adjacently and laterally inboard of the respective gaps **46**, **48** between the back frame lower ends **54'**, **56'** and respective rear seat portions **16"**, **18"**. One configuration of the spring member **64** includes a length in a range of about three inches to about four inches, having a forward portion **64'** and a rear portion **64"** (see Fig. 4). The spring member **64** includes a width of about two inches, plus or minus an inch, and a depth of about one fourth of an inch. The overall depth of each spring unit **62**, **62'** can be readily doubled by stacking and securing opposed ends of stacked spring members **64** (not shown) to provide greater rigidity for the right and left spring units **62**, **62'** and providing a back support frame **50** less inclined to move rearward **82'** (see Fig. 6). A pivot point **76** for each spring member is preferably centered laterally inwardly of a mid-point of respective right and left gaps **46**, **48**, in order to allow the spring member rear portion **64"** to flex downwardly upon reclining movement of the back support frame **50**. The spring member rear portion **64"** is extended distal of each gap **46**, **48** to detachably connect to a portion of the surface of the frame support cross-member **58** attached between the back frame lower ends **54'**, **56'**.

[0019] The spring member material is preferably biased to return to a substantially horizontal, non-flexed position **80** for approximately 100,000 or more repetitions without failure. The resilient material of the spring member **64** is produced by layering fiberglass in sheets to a specified depth, width and length. One embodiment of the spring member **64** includes generally rectangular exterior dimensions, a rectangular cross-section, and generally planar upper and lower surfaces to provide a compact cross sectional outline while maintaining the desired stiffness over the expected life of the stackable chair **10**. One skilled in the art will recognize that alternative cross-sectional outlines can be utilized such as an elongated spring member having a flattened oval cross-section, with generally planar upper and lower surfaces. Each spring member rear portion **64"** is positioned to rotate downwardly during flexing to a flexed position **82** (see Fig. 6), thereby preventing contact with an underside of seat cushion **90**. Maintenance to the spring member **64** can be readily provided by detachment and removal of the seat cushion **90** from connection to the right and left seat members **12**, **14**, detachment of the spring member **64** and installation of a plurality of stacked spring members **64**, and/or installation of a more rigid or less rigid spring member in each spring unit **62, 62'**.

[0020] In order to secure each spring member front portion **64'** relative to the seat assembly **12**, two front support members **66** are positioned inwardly of respective right and left rear seat portions **16"**, **18"**. The following discussion is directed to the left spring unit **62'** and front support member **66** illustrated in Figure 4, but is also indicative of the right spring unit **62** and front support member **66**. Each front flanged support member **66** includes a generally rectangular and horizontally oriented body having a width of about two inches to about two and a half inches inboard of each respective seat member **16**, **18**. In one embodiment, each front flanged support member **66** includes a rounded forward corner **66'** that is disposed inwardly toward a central portion of the seat assembly **12**. A beveled rear edge portion **66"** is provided and is positioned laterally inwardly of the distal end of respective seat member rear portions **16"**, **18"**. A flanged portion **66'"** is configured to form an "L" shaped cross-sectional outline when viewed from a front or a rear position. The flanged portion **66""** includes a sufficient width of about a half inch to about one inch in order to provide adequate vertically oriented surface area for secure bonding to each respective inwardly faced surface of the right seat member **16** and the left seat member **18**. A plurality of connector holes are provided in the base of each front support member **66** for connection of a flexible cover guard **92**

underneath each support member **66** (see Fig. 4). At least one additional connector hole **90'** is provided for releasably connecting an underside portion of the seat cushion **90** to each support member **66** (see Figs. 5 - 6).

[0021] In order to minimize contact of each spring element unit **62**, **62'** with a lower surface of a mounted seat cushion **90**, each front support flanged portion **66'"** is fixedly joined below the horizontal plane of the seat assembly **12** to the respective inwardly faced surfaces of the right and left seat members **16**, **18**. In the mounted position, a downwardly oriented lower surface of the front flanged support member **66** is extended inwardly within the seat assembly interior from a generally flush orientation with a lower surface of the right and left seat members **16**, **18**. The spring member front portion **64'** is attached to the upwardly oriented surface of the front flanged support member **66**. An adequate length and width for the front flanged support member **66** is provided to provide ample surface area for rigid attachment thereon of the spring member front portion **64'**. The width and depth for each front flanged support member **66** is selected to provide a substantially rigid support member formed of metal or other rigid material.

[0022] The seat spring system **60** includes unique features to protect

each spring member from excessive flexing and premature failure. Each spring member **64** is overlaid on each front support member **66** with a front fixation plate **68** attached in covering relationship over each spring member front portion **64'** in order to rigidly secure the front portion of the spring member **64** relative to the seat members **16**, **18**, and to distribute stress over the width of the spring member front portion **64'** during repetitive flexing of the spring member **64**. In the orientations illustrated in Figures 5 and 6, upon rearward movement **82'** to a flexed position **82**, the bottom surface of the spring member **64** is contacted against the beveled edges **58'** and **66"**, thereby minimizing abrasion and wear of the spring member **64** during repetitive bending and rebounding of the back support frame **50**. Each spring member front portion **64'** is rigidly maintained from lateral movement by utilizing a pair of removable connectors **78** extending through each front fixation plate **68**, each spring member front portion **64'**, and each front support member **66**.

[0023] Each right and left spring member rear portion **64"** is secured to an upwardly faced surface on opposed ends of a rear cross-member **58** by a rear fixation plate **70** positioned in a covering relationship thereon, in order to rigidly secure the rear portion **64"** relative to each back support

frame member, and to distribute stress over the width of the rear portion **64"** during repetitive flexing of each spring member **64**. Each spring member rear portion **64"** is maintained from lateral slippage under each rear fixation plate **70** by utilizing a pair of removable connectors **78** extending through rear fixation plate **70**, spring member rear portion **64"** and rear cross-member **58**. During rearward movement **82'** (see Fig. 6), the bottom surface of the spring member **64** is partially engaged **84** against the beveled forward portion **58'** of the rear cross-member **58**, and is partially engaged **84'** against the beveled rear portion **66"** of front flanged support member **66**, thereby minimizing wear of the surfaces of the spring member **64** during repetitive reclining and forward movements of the back support frame **50**.

[0024] An effective forward stop mechanism is provided by each pair of fixation plates **68**, **70** being aligned in abutting relationship and separated by a space of about 0.0625 inch, or less, between the rear edge **68'** of front fixation plate **68** and the front edge **70'** of rear fixation plate **70**. When the back support frame **50** is reclined backwards **82'**, the separation space expands minimally **72'** (see Fig. 6). When the back support frame **50** rebounds to a generally upright, non-flexed position **80** (see Fig. 5), due to

the inherent bias to a planar orientation of each spring member **64**, the limited separation space between adjacent edges **68'**, **70'** of the fixation plates **68**, **70** provides an abutting relationship **72** serving as a stop mechanism preventing excessive forward movement of the back support frame **50** relative to the seat assembly **12**, thereby protecting each spring member **64** from excessive flexing and premature failure.

[0025] A back frame stop mechanism is incorporated in the seat spring system **60** to prevent excessive backwards or forwards flexing of the back support frame **50**. A rear cross-member **38** is extended to join at opposed ends **38'**, **38"** between upper portions of the rear legs **26**, **34**, as illustrated in Figures 1, 5 and 6. An upper surface of the opposed ends of the rear cross-member **38** is positioned about one inch, plus or minus one quarter inch, below the lower surfaces of respective right and left frame lower ends **54'**, **56'**. A right stop guard **86** and a left stop guard **88** are attached to the lower surfaces of respective right and left frame lower ends **54'**, **56'**. The stop guards **86**, **88** can be composed of a high density plastic material, a molded polypropylene material, other similar synthetic polymers or a rubber material. Each stop guard **86**, **88** is positioned on lower surfaces of respective frame lower ends **54'**, **56'**to allow contact by each stop guard **86**,

88 against the upper surface of the rear cross-member **38** when the back frame sides **54**, **56** are moved rearward **82'** by force applied against the back support frame **50**. The stop guards **86**, **88** are shaped to extend downwardly about a half-inch from the lower surfaces of the right and left frame lower ends **54'**, **56'**, with preferably an inverted "U" shaped configuration to provide an encircling contact by each stop guard with the rear cross-member **38** as the right and left frame lower ends **54'**, **56'** are moved downwardly. Alternate shapes and thicknesses can be selected for the stop guards in order to limit the maximum downwards movement of the respective right and left frame lower ends **54'**, **56'** to about a half-inch of motion. Resulting reclining of the back support frame **50** and downwards flexing of the spring member rear portion **64"** is limited to about a half-inch. One skilled in the art will readily recognize that the shape of the stop guards **86**, **88**, the position of the rear cross-member **38**, and the range of extension below the frame lower ends **54'**, **56'** can be altered to provide for greater or lesser reclining movement **82'** of the back support frame **50**. The stop members **86**, **88** prevent excessive backwards reclining of the back support frame **50**, thereby limiting the flexing motion of each spring member **64** in order to minimize breakage or fracture of either spring member **64**.

[0026] As illustrated in Figures 4 - 6, a flexible cover guard **92** is removably installed underneath and in covering relationship for each respective gap **46**, **48** between the rear beveled portion **66"** of the front flanged support member **66** and the front beveled **58'** of the rear cross-member **58**. Each cover guard **92** is composed of pliable plastic material which readily bends during rearward movement **82'** of the back support frame **50** and flexing of each spring member **64**. Each cover guard **92** is secured by connectors **78** or pop rivets (not shown) extended through a connection portion **94** and attached to respective front support members **66**, thereby providing protection from pinching of a seat occupant's fingers when fingers are extended inwardly past right and left upper leg segments **22'**, **30'**, and during reclining movement of the back support frame **50** rearwardly **82'** (see Fig. 6), and rebounding to a non-flexed position **80** (see Fig. 5). Further protection of a seat occupant's fingers is provided by the detachable cushion **90** being sufficiently sized in width and length to adequately cover the seat assembly **12**, thereby denying access from above to the gap separations **46**, **48** during reclining movement of the back support frame **50** and rebounding movement to the non-flexed position **80**.

[0027] Alternative embodiments for the spring element unit **60** include

a plurality of spring members **64** stacked and aligned on each other, thereby increasing the rigidity of each spring element unit **62**, **62'**. Alternative spring members include planar spring members having a plurality of widths, thicknesses, or lengths depending on the design of the stackable chair and the weights of the occupants predicted to be supported by the back support frame **50** during repetitive reclining movements. Each spring member **64** is composed of substantially stiff material, such as one example including layered fiberglass, which is capable of being repetitively flexed along a length dimension without failure. The chemical composition of each spring member **64** can be modified for production of a spring member having greater or lesser flexibility. Each right and left spring member **64** can be independently disconnected and replaced with a like configuration, or an alternative configuration of the spring member without removing the rear cross-member **58** or either of the front flanged support members **66**.

[0028] An alternative embodiment for the back frame rear cross-member **58** can include back support frame lower ends **54'**, **56'** having attached thereto a pair of inwardly extending rear flanged support members (not shown) shaped similar to, but with a reversed orientation of the front

flanged support members **66**. The pair of rear flanged support members would replace the rear cross-member **58**, and would be attached to extend laterally inwardly from respective right and left frame lower ends **54'**, **56'**. Each rear flanged support member would extend distal of each gap separation **46**, **48** and would include a planar base portion for connection thereon of the respective rear portion **64"** of each spring member **64**. Each rear flanged support member would include a beveled forward edge similar to the beveled forward edge **58'** of rear cross-member **58** to minimize abrasive wear of each spring member **64** contacting respective rear flanged support members during reclining movement of the back support frame **50**.

[0029] The use of inwardly laterally positioned and appropriately sized spring member units **62**, **62'** for articulated support of the back support frame **50** provides for rapid assembly during manufacture of each chair **10**. Each spring member **64** is releasably attachable to the rear cross-member **58** and either front support members **66** for adjustment and/or removal of one or both right and left spring members **64**. Each spring member **64** is replaceable with a spring member having similar or alternative properties by removing the readily detachable seat cushion **90**, connectors **78** and fixation plates **68**, **70**.

[0030] An alternate shape for a front flanged support member **166** is illustrated in Figures 7A and 7B. In order to attach a bottom side of the seat cushion **90** (see Figs. 5 and 6) to a central portion of the seat assembly **12**, a front flanged support segment **166** is provided having an elongated base width extending about three and a half inches to about four inches inwardly from each respective seat member **16**, **18** to form a curved projection **166""** having an additional connector hole **90"** therethrough. Each front flanged support segment **166** includes an arcuate leading edge **166'**, an upwardly beveled trailing edge **166"**, and a flanged connecting edge **166'"** joined inboard of respective seat members **16**, **18**. A right front flanged support segment **166** is configured as a mirror-image of the illustrated left front flanged support segment **166** (see Fig. 7A). Spring tension is provided by each front portion **64'** of respective spring members **64** being releasably attachable to each front support member **166** as illustrated in Figure 7B. Each rear portion **64"** of respective spring members **64** are releasably attachable to a rear spring support cross-member **58** (see Figs. 4 - 6). One skilled in the art will recognize that additional shapes for each front flanged support segment **166** are readily utilized in accordance with the invention disclosed herein. Regardless of the shape of each front flanged support segment **66** or **166**, it is important that

each front support segment extends partially inwardly between seat members **16**, **18**, thereby providing a void space **20** between right and left spring units **62**, **62'** (see Fig. 1), for convenient access to each spring unit **62**, **62'**, and/or access to the bottom of the seat cushion **90** for inspection, disconnection and reconnection for replacement of the seat cushion and periodic maintenance to either spring unit.

[0031] While a preferred embodiment is shown and described, it will be understood that it is not intended to limit the disclosure, but rather it is intended to cover all modifications and alternate methods falling within the spirit and the scope of the invention as defined in the appended claims.